IDENTIFIES RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS:

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GENERAL NOTES

1. All setting out to be in accordance with the Architects drawings. Any discrepancies between the Engineers and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
2. All drainage to be installed in accordance with relevant Building Regulations documents and Current Sewers for Adoption where applicable.
3. Connections to Public sewers to be agreed and inspected by Water Authority.
4. Invert level, size and cover levels to existing manholes and sewers to be checked prior to any construction. Any discrepancies to be reported immediately.
5. Invert to base of soil stack bends to be 450mm below lowest branch connection for up to 3 storeys buildings.
6. All RWP and Foul Water drain point setting out is to be confirmed by Architect.
7. All RWP & SVP sizes & setting out by Architect / M&E Engineer. All below ground connections to match above ground outlet size, Min 100/110mm diameter.
8. Foul drains to project 100mm above finished floor level.
9. All internal Manholes and Inspection Chambers to have double sealed recessed covers to suit floor finishes by Architect.
10. All external covers in footpaths and roads in non tarmac areas to have recessed trays to suit the paving material.
11. Refer to drainage specification for pipe materials.
12. All pipework to be 100/110Ø UNO. Refer to note 7 connection sizes.
13. All foul and surface water drainage stacks to have above ground rodding access, refer to above ground drainage layout by others.
14. This drawing has been produced in colour and should be reproduced in colour for clarity.
15. A CCTV Survey and report in WINCAN format for all new drainage will be required before the "As Built" drawings will be issued.

Scale 1:250 (m)
0 2 4 6 8 10

Rev.	Amendment	Drn	Chkd	Date
P01	Preliminary	DH	GT	12.05.21

Drg. Status: **PRELIMINARY** Suitability: **S3**

AKSWard
CONSTRUCTION CONSULTANTS
Seacourt Tower
West Way
Oxford
OX2 0JJ
Tel: 01865 240071
Fax: 01865 248006
e-mail: oxford@aksward.com
web: www.aksward.com
☐ London ☐ Hitchin ■ Oxford ☐ Southampton ☐ Birmingham

Client: **Galliford Try**

Project: **Cornerstone School, Bexley**

Title: **Exceedance Flow Path 100Year + 40% Climate Change Critical Storm**

Reviewed Scheme	GT	Date	12.05.21
Reviewed Final		Date	
Scales at A1	1:250	Project No.	X202063

Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
CSS	AKS	ZZ	XX	DR	C	9205	P01

IDENTIFIES RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS:

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GENERAL NOTES

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3. Connections to Public sewers to be agreed and inspected by Water Authority.
4. Invert level, size and cover levels to existing manholes and sewers to be checked prior to any construction. Any discrepancies to be reported immediately.
5. Invert to base of soil stack bends to be 450mm below lowest branch connection for up to 3 storeys buildings.
6. All RWP and Foul Water drain point setting out is to be confirmed by Architect.
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Scale 1:250 (m)
0 2 4 6 8 10

Rev.	Amendment	Drn	Chkd	Date
P01	Preliminary	DH	GT	26.04.21

Drg. Status: **PRELIMINARY** Suitability: **S3**

AKSWard
CONSTRUCTION CONSULTANTS
Seacourt Tower
West Way
Oxford
OX2 0JJ
Tel: 01865 240071
Fax: 01865 248006
e-mail: oxford@aksward.com
web: www.aksward.com
☐ London ☐ Hitchin ■ Oxford ☐ Southampton ☐ Birmingham

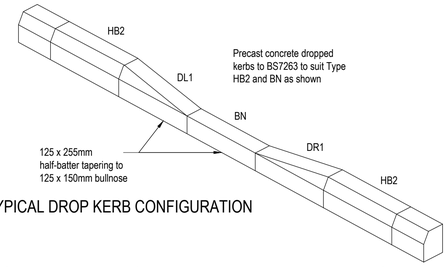
Client: **Galliford Try**

Project: **Cornerstone School, Bexley**

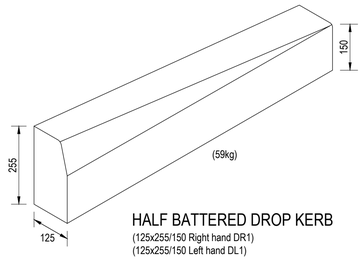
Title: **Exceedance Flow Path Critical Storms Greater than 100 Year + Climate Change**

Reviewed Scheme	GT	Date	12.05.21
Reviewed Final		Date	
Scales at A1	1:250	Project No.	X202063

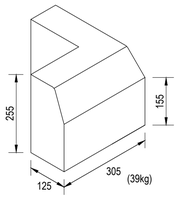
Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
CSS	AKS	ZZ	XX	DR	C	9206	P01



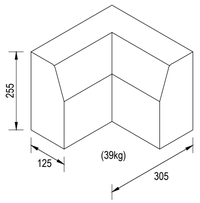
TYPICAL DROP KERB CONFIGURATION



HALF BATTERED DROP KERB
(125x255/150 Right hand DR1)
(125x255/150 Left hand DL1)



CONVEX (EXTERNAL)
(125x255 HBXA)



CONCAVE (INTERNAL)
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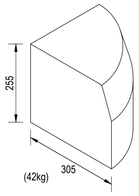
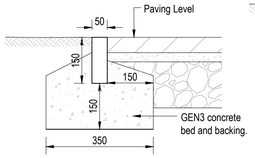
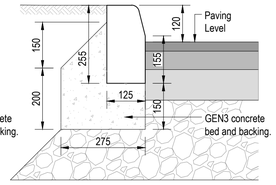


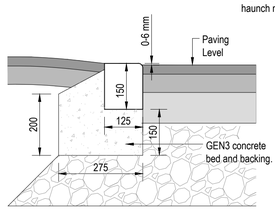
SMALL QUADRANT
(305x255 QHB)



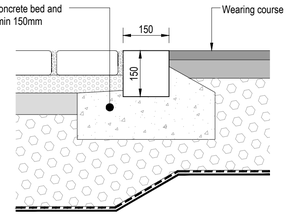
EDGING FLAT TOP
(50x150 EF)



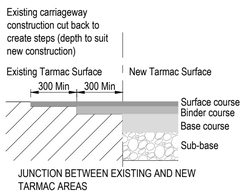
HALF BATTERED KERB
(125x255 HB2)



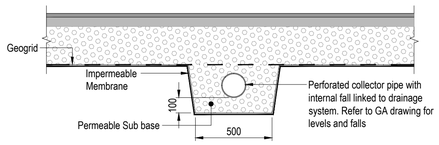
BULLNOSED KERB
(125x150 BN)



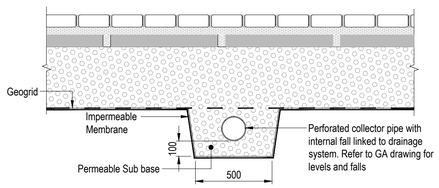
JUNCTION BETWEEN PERMEABLE PAVING & TARMAC
(Formation to be proof rolled prior to construction)



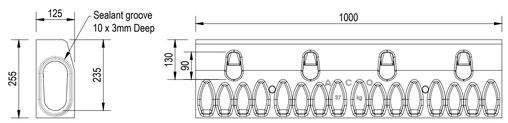
JUNCTION BETWEEN EXISTING AND NEW TARMAC AREAS



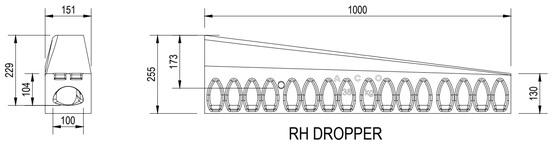
TYPICAL SECTION THROUGH DISTRIBUTION PIPE



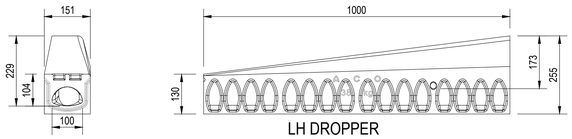
TYPICAL SECTION THROUGH DISTRIBUTION PIPE



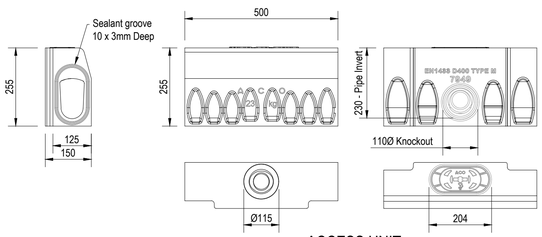
ACO HB KERB DRAIN



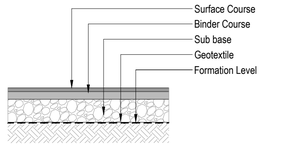
RH DROPPER



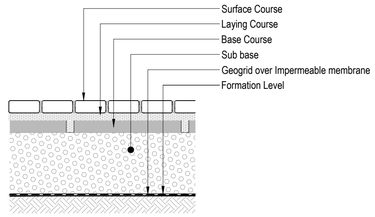
LH DROPPER



ACCESS UNIT

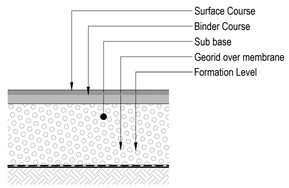


PEDESTRIAN FOOTPATH ASPHALT		
Assumed CBR >3% (Subgrade to be proof rolled)		
Layer	Thickness	Material
Surface Course	25mm	AC 6 medium surface course PD 6691 Annex B
Binder Course	50mm	AC 20 dense binder course PD 6691 Annex B
Sub base	150mm	Type 1 Material in accordance with Specification for Highway Works Clause 803
Geotextile		Terram 1000

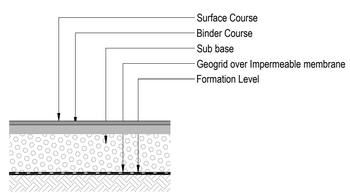


- Cutting Blocks; use a diamond bladed saw. Block splitters are NOT permitted
- Small slender cuts less than 25% NOT permitted.
- Joint space; blocks to be tightly butted
- Edge restraints shall be installed along the exposed perimeter and to drainage items and other penetrations within the pavement

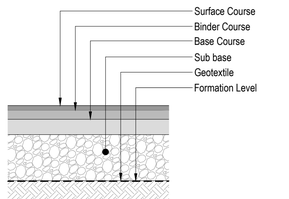
PERMEABLE BLOCK PAVING NO INFILTRATION (CARS & VANS ONLY)		
Assumed CBR >3% (Subgrade to be proof rolled)		
Layer	Thickness	Material
Surface Course	80mm	Permeable concrete block with interlocking nibs to Architects detail. Jointing material to block manufacturers specification. Allow for topping up of jointing material 3 months after completion.
Laying Course	50mm	Angular bedding material to BS EN 13242 and in accordance with the paving block manufacturer.
Base Course	70mm	AC32 40/60. in accordance with BS EN 13108-1. Temporary access for construction traffic. Prior to installation of the paving units the AC is cleaned to removed mud and detritus, cored with 75mm dia holes on a 750mm orthogonal grid to form CAC (cored asphalt concrete). The holes are filled with laying course aggregate.
Sub base	400mm	Coarse graded aggregate (CGA) to comply with BS EN 13242 (BSI 2007 or BS 12620 (BSI 2008). Deemed to comply Type 3 sub base 0mm-40mm SHW Serier 800 or Coarse graded aggregate 4mm-20mm BS7533-13. Laid in maximum 150mm layer
Geogrid		NAUE combigrid 40/40
Impermeable Membrane		HDPE membrane with fully welded membrane



TANKED ASPHALT (Car park)		
Assumed CBR >3% (Subgrade to be proof rolled)		
Layer	Thickness	Material
Surface Course	30mm	AC10 close surf PD6691 Annex B. Binder grade 100/150.
Binder Course	60mm	AC20 dense bin PD6691 Annex B. Binder 100/150.
Sub Base	400mm	Coarse graded aggregate (CGA) to comply with BS EN 13242 (BSI 2007 or BS 12620 (BSI 2008). Deemed to comply Type 3 sub base 0mm-40mm SHW Serier 800 or Coarse graded aggregate 4mm-20mm BS7533-13. Laid in maximum 150mm layer
Geogrid		NAUE combigrid 40/40
Impermeable Membrane		HDPE membrane with fully welded joints



PERMEABLE (TANKED) ASPHALT MUGA DETAIL		
Assumed CBR >3% (Subgrade to be proof rolled)		
Layer	Thickness	Material
Surface Course	25mm	6 mm SuperDrainasphalt.
Binder Course	60mm	20 mm SuperDrainasphalt.
Sub base	300mm	Coarse graded aggregate (CGA) to comply with BS EN 13242 (BSI 2007 or BS 12620 (BSI 2008). Deemed to comply Type 3 sub base 0mm-40mm SHW Serier 800 or Coarse graded aggregate 4mm-20mm BS7533-13. Laid in maximum 150mm layer
Geogrid		NAUE combigrid 40/40
Impermeable Membrane		HDPE membrane with fully welded membrane



DBM ASPHALT (public car park and occasional HGV movements)		
Assumed CBR >3% (Subgrade to be proof rolled)		
Layer	Thickness	Material
Surface Course	30mm	AC10 close surf PD6691 Annex B. Binder grade 100/150.
Binder Course	60mm	AC20 dense bin PD6691 Annex B. Binder 100/150.
Base Course	100mm	AC32 base PD6691 Annex B. Binder 100/150.
Sub Base	300mm	Type 1 Material in accordance with Specification for Highway Works Clause 803
Geogrid		NAUE combigrid 40/40

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2. All materials to Highways Agency "Specification for highways works."
3. Contractor to confirm CBR at formation level.
4. Soft Spots in subgrade:
   Excavate to remove soft or degraded material, then backfill with specified granular sub-base material and compact
5. All Paving blocks / slabs to be laid in accordance with current Interpave Guidance documents
6. All in-situ concrete works to be carried out in accordance with The Concrete Society Technical Report No 66. External In-situ Concrete Paving.
7. Concrete joint sealant to comply with Highways Agency Manual of contract documents for highway works MCHW1, clause 1017.

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Rev.	Amendment	Drn	Chkd	Date
P01	Preliminary	DH	GT	24.04.21

Drg. Status: **Preliminary** Suitability: **S3**

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CONSTRUCTION CONSULTANTS
Seacourt Tower
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Oxford
OX2 0JJ
Tel: 01865 240071
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☐ London ☐ Hitchin ■ Oxford ☐ Southampton ☐ Birmingham

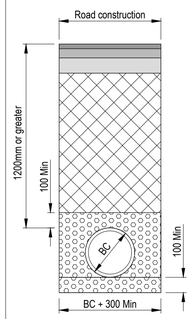
Client: **Galliford Try**

Project: **Cornerstone School, Bexley**

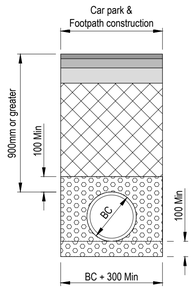
Title: **Road and Footpath Construction Details**

Reviewed Scheme: GT Date: 24.04.21
Reviewed Final: Date:
Scales at A1: NTS Project No.: **X202063**

Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
CSS	AKS	ZZ	XX	DR	C	9501	P01



CLASS "P" BEDDING DETAIL



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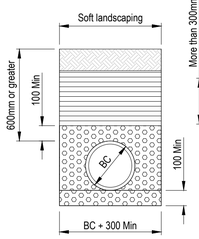

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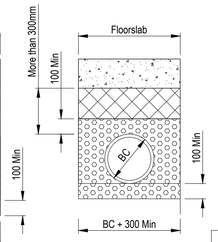


CLASS "W" BEDDING DETAIL

Granular Bedding and Sidefill

GEN3 Concrete

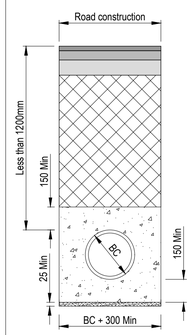
DOT Type 1 granular fill
backfill well compacted in 150mm layers

Material excavated from trench compacted in layers not exceeding 300mm thick. do not use heavy compactors before there is 600mm of material over pipes.

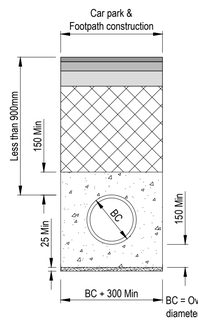
Extract from Table A2 WIS 4-08-02

Processed granular bedding and sidefill materials for flexible pipes

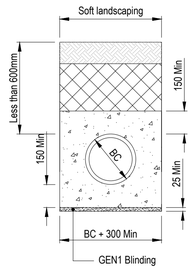
Pipe nominal bore (mm)	Nominal maximum particle size (mm)	Materials specified in British Standards
100	10	10mm nominal single-size
Over 100 to 500	15	10 or 14mm nominal single-size or 14mm to 5mm graded
Over 150 to 300	20	10, 14 or 20mm nominal single-size or 14mm to 5mm graded or 20mm to 5mm graded
Over 300 to 550	20	14 or 20mm nominal single-size or 14mm to 5mm graded or 20mm to 5mm graded
Over 550	40	14, 20 or 40mm nominal single-size or 14mm to 5mm graded or 20mm to 5mm graded or 40mm to 5mm graded



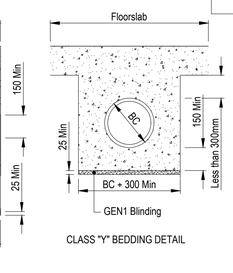
CLASS "Z" BEDDING DETAIL



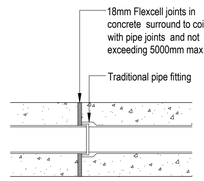
CLASS "Z" BEDDING DETAIL



CLASS "Z" BEDDING DETAIL



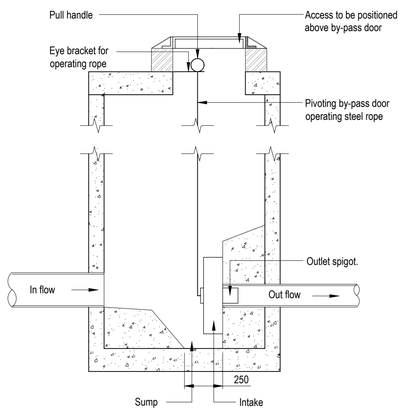
CLASS "Y" BEDDING DETAIL



FLEXIBLE JOINTS
IN CLASS "Z" and "Y" CONCRETE SURROUND

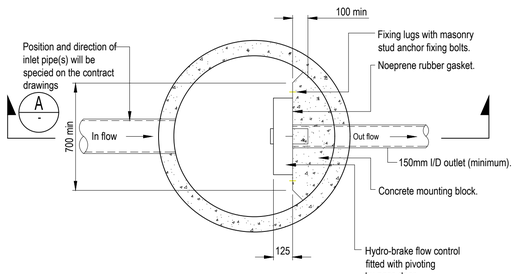
PLASTIC PIPES DETAIL

Scale 1:20



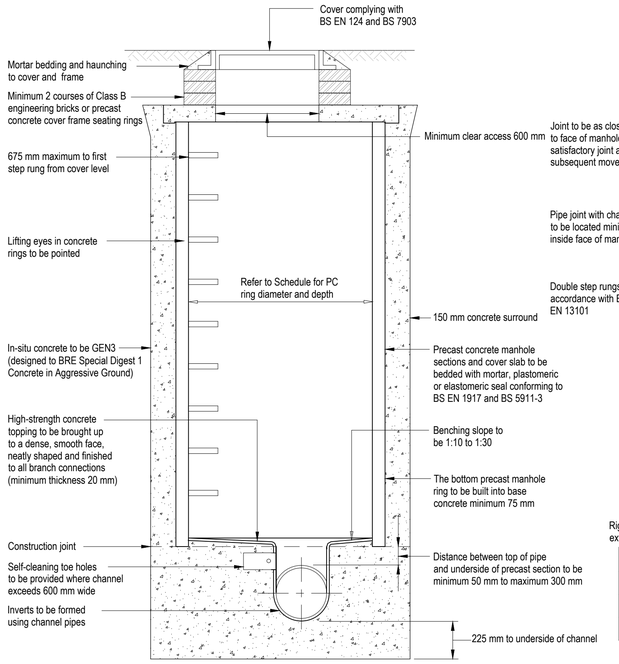
SECTION A-A

Scale 1:20



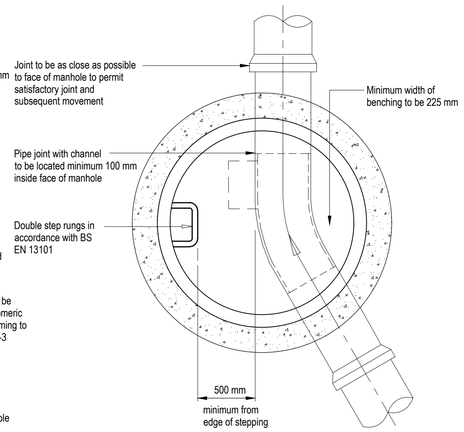
CONTROL CHAMBER

Scale 1:20



TYPICAL MANHOLE DETAIL - TYPE B

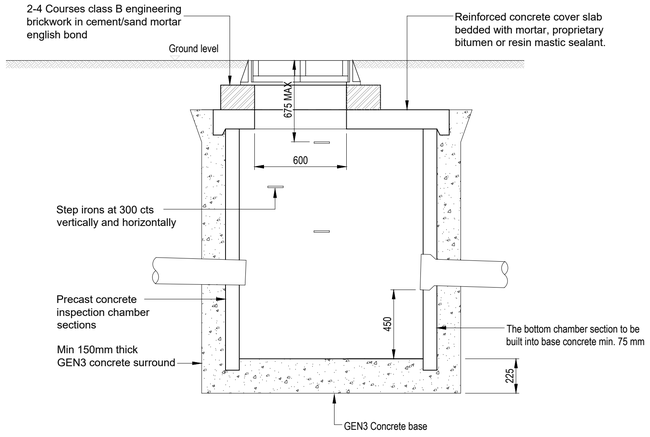
Maximum depth from cover level to soffit of pipe 3.0 m
Scale 1:20



Rigid pipes built into manhole should have a flexible joint as close as feasible to the external face of the structure and the length of the next rocker pipe should be as shown.

Nominal diameter (mm)	Maximum effective length (m)
150 - 600	0.6
601 - 750	1.00
over 750	1.25

All pipes entering the bottom of the manhole to have soffits level UNO.



CONCRETE CATCHPIT

Scale 1:20

Pipe ø	Rocker pipe length (m)
150-600	0.6
675-750	1.0
> 750	1.25

Diameter of largest pipe in manhole	Internal diameter of manhole (mm)
Less than 375	1200
375-450	1350
500-700	1500
>900	CONSULT UNDERTAKER

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GENERAL NOTES

1. All setting out to be in accordance with the Architects drawings. Any discrepancies between the Engineers and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
2. All drainage to be installed in accordance with relevant Building Regulations documents and Sewers for Adoption 7 where applicable.
3. Connections to Public sewers to be agreed and inspected by Water Authority.

IDENTIFIES RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS:

NOTE: The list below and notes on the drawing identify risks which are deemed to be unusual, abnormal, residual or unexpected to a competent contractor carrying out the works. These notes relate to risks which we have been unable to design out.

Rev.	Amendment	Drn	Chkd	Date
P01	Preliminary	DH	GT	26.04.21

Drg. Status: **Preliminary** Suitability: **S3**

AKSWard
CONSTRUCTION CONSULTANTS
Seacourt Tower
West Way
Oxford
OX2 0JJ
Tel: 01865 240071
Fax: 01865 248006
e-mail: oxford@aksward.com
web: www.aksward.com
☐ London
☐ Hitchin
■ Oxford
☐ Southampton
☐ Birmingham

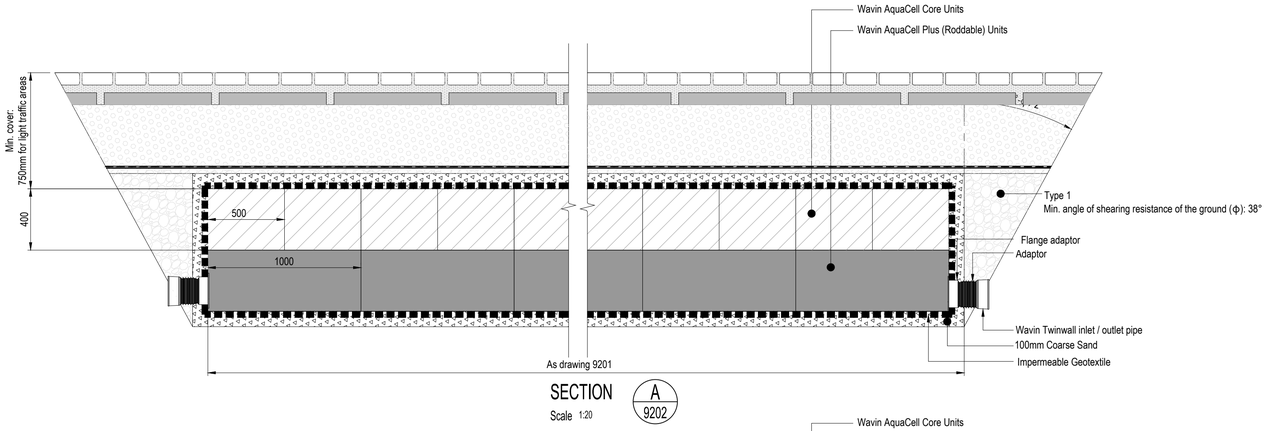
Client: **Galliford Try**

Project: **Cornerstone School, Bexley**

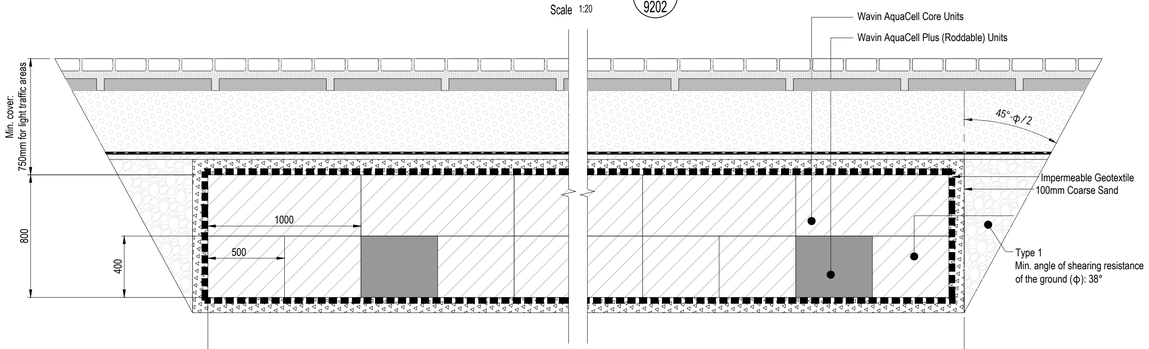
Title: **Drainage Standard Details Sheet 1**

Reviewed Scheme: GT Date: 26.04.21
Reviewed Final: Date:
Scales at A1: NTS Project No.: **X202063**

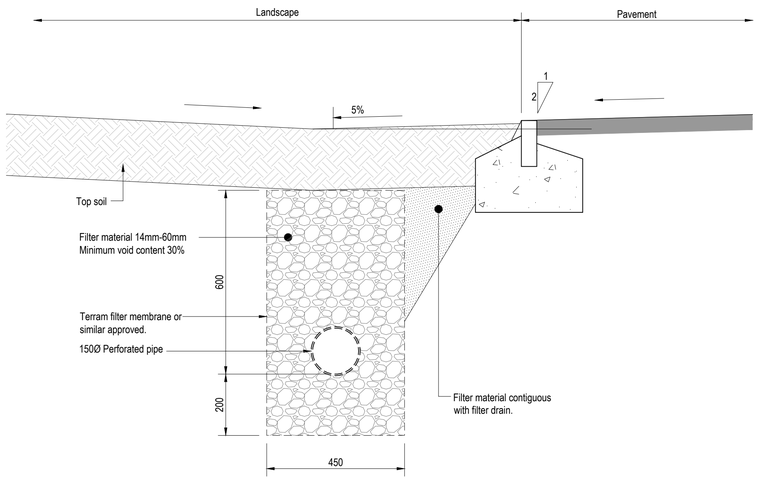
Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
CSS	AKS	ZZ	XX	DR	C	9250	P01



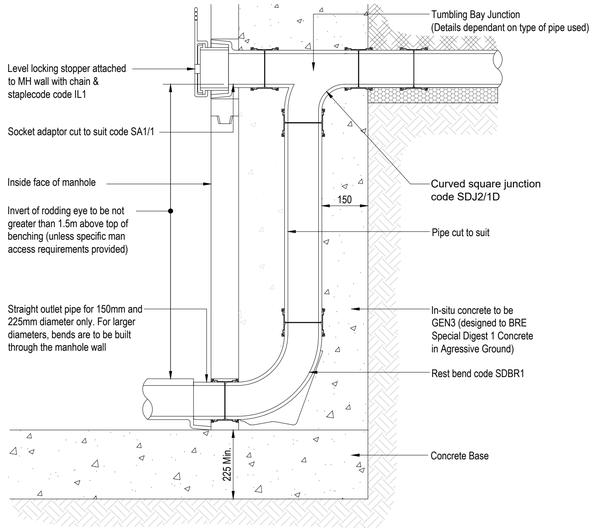
SECTION A
Scale 1:20
9202



SECTION B
Scale 1:20
9202



GRAVEL TRENCH
Scale 1:10



EXTERNAL BACKDROP DETAIL
Scale 1:10

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GENERAL NOTES

1. All setting out to be in accordance with the Architects drawings. Any discrepancies between the Engineers and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
2. All drainage to be installed in accordance with relevant Building Regulations documents and Sewers for Adoption 7 where applicable.
3. Connections to Public sewers to be agreed and inspected by Water Authority.

IDENTIFIES RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS:

NOTE: The list below and notes on the drawing identify risks which are deemed to be unusual, abnormal, residual or unexpected to a competent contractor carrying out the works. These notes relate to risks which we have been unable to design out.

Rev.	Amendment	Drn	Chkd	Date
P01	Preliminary	DH	GT	26.04.21

Drg. Status: **Preliminary**
Suitability: **S5**

AKSWard
CONSTRUCTION CONSULTANTS
Seacourt Tower
West Way
Oxford
OX2 0JJ
Tel: 01865 240071
Fax: 01865 248006
e-mail: oxford@aksward.com
web: www.aksward.com
☐ London
☐ Hitchin
■ Oxford
☐ Southampton
☐ Birmingham

Client: **Galliford Try**

Project: **Cornerstone School, Bexley**

Title: **Drainage Standard Details Sheet 3**

Reviewed Scheme: GT — Date: 26.04.21
Reviewed Final: — Date:
Scales at A1: NTS
Project No.: **X202063**

Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
CSS	AKS	ZZ	XX	DR	C	9252	P01

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N

28 Parking spaces

MUGA 20X35M

RETAINING WALL TO BE LIFTED & RE-LAID TO MAKE THE MUGA LEVEL TO MEET SPORT ENGLAND REQUIREMENTS FOR SURFACE TO BE LEVEL
PITCH MARKINGS FOR TENNIS, NETBALL & 5-A-SIDE FOOTBALL

1:100

Existing Retaining Wall

Existing Steps Retained

Existing Steps Retained

Existing Retaining Wall

Existing Brick Piers to be removed

Existing Brick Piers to be removed

Existing Retaining Wall Retained
Railing to the top of wall to be removed

NEW RAMP AND STEPS

RELOCATED DOOR POSITION

1No Large Parking Space

Mini Bus Parking 2.5m x 7.5m

3 No Parking Space

Bin Store

Covered Cycle Store

New Steps

Ref. BT20 Lebanese cedar

Ref. BT24 Sycamore

Ref. BT19 Sycamore

Ref. T1 Sycamore

Ref. T2 Sycamore

Ref. T3 Ash

Ref. T4 Magnolia spp

Ref. T5 Magnolia spp

Ref. T6 Wild cherry

Ref. T7 Sycamore

Ref. T8 Ash

Ref. T9 Red oak

Ref. T10 Crab apple

Ref. T11 Crab apple

Ref. T12 English oak

Ref. T13 Ash

Ref. T14 Crab apple

Ref. T16 Ash

Ref. T17 Goat willow

Ref. T18 Black locust

0 5 10 15 20 25m
SCALE

Site
- Site Boundary

Softworks
- Proposed Trees
- Existing Trees to be Retained
- Tree to be removed
- Existing vegetation to be retained
- Native and Ornamental Shrub Planting
- Growing Area
- Hedge Planting
- Grass Area
- Wildfower

Hardworks
- Existing building footprint
- New Pedestrian Bitumen Macadam
- Sport Spec Bitumen Macadam
- New Vehicular Bitumen Macadam
- Existing Macadam to be retained subject to condition survey
- Parking Bays
- Bound Gravel

Fencing
- 1.5m Weldmesh Fencing
- New 2.5m Weldmesh Fencing
- 3m High Sports Fencing to MUGA, Duo Sports double wire sports fencing system or similar equivalent.Black
- 1.8m High Timber Hit & Miss Vertical Fencing
- 1.1 m high ballustrade
- Existing 3M high pallisade fence to be clad with 2.1m high closeboard fencing
- New retaining wall
- Existing retaining wall retained

Furniture
- Covered Cycle Parking
- Growing Bed
- Bench

Levels
- Existing level
- Proposed level
- CP — Active Charging ports
- PP — Passive Charging ports

REV	DATE	COMMENTS	DRN	CHK	APP
P3	09/05/21	Gate positions amended, Potential substation location removed, Parking rearranged, Steps width reduced, trees added	MA	MJ	
P2	28/04/21	2.5m gate and fence and grass area added	MA	MJ	
P1	20/04/21	Charging ports added - 20% active / 10% Passive	MA	MJ	

ubu design

UBU Design LTD
7a Wintex House, Easton Lane
Business Park, Easton Lane,
Winchester, Hants, SO23 7RQ
+44 (0) 1962 856 008
studio@ubu-design.co.uk
www.ubu-design.co.uk

PROJECT:	CORNERSTONE SCHOOL
TITLE:	GENERAL ARRANGEMENT PLAN
CLIENT:	GALLIFORD TRY
SCALE: 1:250@A1	DATE: 15/04/2021
JOB NO: 1837	DWG NO: CSS-UBU-ZZ-ZZ-DR-L-1000
STATUS: INFORMATION	REV: P3

Appendix D

Proposed Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.447	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.198	4-8	0.363	8-12	0.079	12-16	0.013

Total Area Contributing (ha) = 0.654

Total Pipe Volume (m^3) = 415.216

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m^3/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	9
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.447		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 12, DS/PN: 1.014, Volume (m³): 168.9

Unit Reference	MD-SHE-0079-3800-2000-3800
Design Head (m)	2.000
Design Flow (l/s)	3.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	79
Invert Level (m)	9.996
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	3.8
Flush-Flo™	0.349	2.9
Kick-Flo®	0.711	2.4
Mean Flow over Head Range	-	2.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.3	1.200	3.0	3.000	4.6	7.000	6.8
0.200	2.8	1.400	3.2	3.500	4.9	7.500	7.1
0.300	2.9	1.600	3.4	4.000	5.2	8.000	7.3
0.400	2.9	1.800	3.6	4.500	5.5	8.500	7.5
0.500	2.9	2.000	3.8	5.000	5.8	9.000	7.7
0.600	2.7	2.200	4.0	5.500	6.1	9.500	7.9
0.800	2.5	2.400	4.1	6.000	6.4		
1.000	2.8	2.600	4.3	6.500	6.6		

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Storage Structures for Storm

Filter Drain Pipe: 2.000

Manning's N	0.075	Trench Length (m)	19.8
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.200
Safety Factor	2.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	94.0
Invert Level (m)	17.020	Cap Volume Depth (m)	0.000
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.003

Manning's N	0.075	Trench Length (m)	22.2
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.200
Safety Factor	2.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	36.4
Invert Level (m)	16.480	Cap Volume Depth (m)	0.000
Trench Width (m)	1.0	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 3.000

Manning's N	0.075	Trench Length (m)	24.3
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.200
Safety Factor	2.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	242.7
Invert Level (m)	16.810	Cap Volume Depth (m)	0.000
Trench Width (m)	1.0	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 3.001

Manning's N	0.075	Trench Length (m)	22.8
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	2.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	37.4
Invert Level (m)	16.710	Cap Volume Depth (m)	0.000
Trench Width (m)	1.0	Cap Infiltration Depth (m)	0.000

Porous Car Park Pipe: 7.000

Manning's N	0.075	Width (m)	10.0
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	34.0
Membrane Percolation (mm/hr)	1000	Slope (1:X)	100.1
Max Percolation (l/s)	94.5	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	85
Invert Level (m)	13.000		

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Porous Car Park Pipe: 8.000

Manning's N	0.075	Width (m)	10.0
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	34.2
Membrane Percolation (mm/hr)	1000	Slope (1:X)	100.7
Max Percolation (l/s)	95.1	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	85
Invert Level (m)	13.000		

Porous Car Park Pipe: 9.000

Manning's N	0.075	Width (m)	14.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	32.7
Membrane Percolation (mm/hr)	1000	Slope (1:X)	77.7
Max Percolation (l/s)	131.5	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	90
Invert Level (m)	12.100		

Porous Car Park Pipe: 10.000

Manning's N	0.075	Width (m)	14.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	35.8
Membrane Percolation (mm/hr)	1000	Slope (1:X)	715.9
Max Percolation (l/s)	144.2	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	90
Invert Level (m)	10.270		

Cellular Storage Pipe: 1.013

Manning's N	0.050	Infiltration Coefficient Side (m/hr)	0.00000
Invert Level (m)	10.070	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	227.4	120.0	0.801	0.0	156.8
0.800	227.4	156.8			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	9
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.440
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	01	15 Winter	1	+0%	100/15 Summer			
2.000	SW01	15 Winter	1	+0%				
2.001	SW02	15 Winter	1	+0%	100/15 Summer			
1.001	J1	15 Winter	1	+0%	30/15 Summer			
1.002	J2	15 Winter	1	+0%				
1.003	02	15 Winter	1	+0%				
3.000	SW03	15 Winter	1	+0%				
3.001	SW04	15 Winter	1	+0%				
3.002	SW05	15 Winter	1	+0%	100/15 Summer	100/15 Winter		
1.004	03	15 Winter	1	+0%	30/15 Summer			
1.005	J3	15 Winter	1	+0%				
4.000	05	15 Winter	1	+0%	100/15 Summer			
4.001	J4	15 Winter	1	+0%				
4.002	06	15 Winter	1	+0%	30/15 Summer			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	01	16.825	-0.170	0.000	0.13			5.0	OK	
2.000	SW01	17.063	-0.757	0.000	0.02		6	0.5	OK	
2.001	SW02	16.830	-0.129	0.000	0.05			0.9	OK	
1.001	J1	16.713	-0.156	0.000	0.20			7.4	OK*	
1.002	J2	16.668	-0.133	0.000	0.20			8.7	OK*	
1.003	02	16.653	-0.857	0.000	0.10		6	12.9	OK	
3.000	SW03	16.932	-0.678	0.000	0.07		7	2.5	OK	
3.001	SW04	16.758	-0.752	0.000	0.03		8	2.5	OK	
3.002	SW05	16.133	-0.117	0.000	0.11			2.9	OK	1
1.004	03	15.952	-0.113	0.000	0.49			14.1	OK	
1.005	J3	15.930	-0.125	0.000	0.40			14.7	OK*	
4.000	05	15.851	-0.194	0.000	0.05			1.7	OK	
4.001	J4	15.768	-0.181	0.000	0.08			3.1	OK*	
4.002	06	15.747	-0.128	0.000	0.15			4.2	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.006	04	15 Winter	1	+0%	30/15 Summer			
5.000	EX 15	15 Winter	1	+0%				
5.001	Ex 16	15 Winter	1	+0%	100/15 Winter			
1.007	07	15 Winter	1	+0%	100/15 Summer			
1.008	J5	15 Winter	1	+0%				
1.009	J6	15 Winter	1	+0%				
1.010	Ex 18	15 Winter	1	+0%	100/15 Summer			
6.000	Ex .39	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
6.001	Ex 38	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
6.002	Ex 37	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
6.003	Ex 36	15 Winter	1	+0%	30/15 Summer			
6.004	Ex J1	15 Winter	1	+0%				
6.005	Ex J2	15 Winter	1	+0%				
6.006	Ex 35	15 Winter	1	+0%				
6.007	08	15 Winter	1	+0%	100/15 Summer	100/15 Summer		
1.011	09	15 Winter	1	+0%	100/15 Summer			
7.000	15	15 Winter	1	+0%				
7.001	16	15 Winter	1	+0%				
8.000	17	15 Winter	1	+0%				
8.001	18	15 Winter	1	+0%				
1.012	10	15 Winter	1	+0%	100/15 Winter			
9.000	19	15 Winter	1	+0%				
9.001	20	30 Winter	1	+0%				
10.000	21	15 Winter	1	+0%	100/180 Winter	100/360 Winter		
10.001	22	15 Winter	1	+0%	30/240 Winter	100/240 Winter		
1.013	11	240 Winter	1	+0%				
1.014	12	240 Winter	1	+0%	1/30 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.006	04	15.745	-0.100	0.000	0.58			20.0	OK
5.000	EX 15	16.015	-0.200	0.000	0.03			1.4	OK
5.001	Ex 16	15.819	-0.186	0.000	0.07			4.8	OK
1.007	07	15.534	-0.141	0.000	0.30			26.5	OK
1.008	J5	15.130	-0.144	0.000	0.28			27.3	OK*
1.009	J6	14.673	-0.129	0.000	0.38			28.2	OK*
1.010	Ex 18	14.373	-0.148	0.000	0.26			29.1	OK
6.000	Ex .39	17.205	-0.055	0.000	0.40			2.3	FLOOD RISK
6.001	Ex 38	16.891	-0.049	0.000	0.52			4.4	OK
6.002	Ex 37	16.495	-0.025	0.000	0.92			8.8	OK
6.003	Ex 36	15.998	-0.042	0.000	0.63			9.7	OK
6.004	Ex J1	15.594	-0.039	0.000	0.69			10.4	OK*
6.005	Ex J2	15.177	-0.047	0.000	0.54			11.2	OK*
6.006	Ex 35	14.361	-0.174	0.000	0.12			11.2	OK
6.007	08	13.927	-0.148	0.000	0.25			17.8	OK

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.011	09	13.599	-0.126	0.000	0.40			49.5	OK
7.000	15	13.030	-0.265	0.000	0.03		5	4.3	OK
7.001	16	12.695	-0.190	0.000	0.06			4.1	OK
8.000	17	13.020	-0.275	0.000	0.01		5	1.7	OK
8.001	18	12.685	-0.200	0.000	0.03			2.2	OK
1.012	10	12.086	-0.138	0.000	0.32			51.9	OK
9.000	19	12.119	-0.471	0.000	0.00		5	2.7	OK
9.001	20	11.703	-0.202	0.000	0.02			4.0	OK
10.000	21	10.304	-0.456	0.000	0.00		7	0.5	OK
10.001	22	10.242	-0.203	0.000	0.02			1.4	OK
1.013	11	10.225	-0.646	0.000	0.01			10.5	OK
1.014	12	10.225	0.079	0.000	0.09			2.9	SURCHARGED

PN	US/MH Name	Level Exceeded
1.006	04	
5.000	EX 15	
5.001	Ex 16	
1.007	07	
1.008	J5	
1.009	J6	
1.010	Ex 18	
6.000	Ex .39	6
6.001	Ex 38	6
6.002	Ex 37	5
6.003	Ex 36	
6.004	Ex J1	
6.005	Ex J2	
6.006	Ex 35	
6.007	08	2
1.011	09	
7.000	15	
7.001	16	
8.000	17	
8.001	18	
1.012	10	
9.000	19	
9.001	20	
10.000	21	
10.001	22	7
1.013	11	
1.014	12	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	9
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.440
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	01	15 Winter	30	+0%	100/15 Summer			
2.000	SW01	15 Winter	30	+0%				
2.001	SW02	15 Winter	30	+0%	100/15 Summer			
1.001	J1	15 Winter	30	+0%	30/15 Summer			
1.002	J2	15 Summer	30	+0%				
1.003	02	15 Winter	30	+0%				
3.000	SW03	15 Winter	30	+0%				
3.001	SW04	15 Winter	30	+0%				
3.002	SW05	15 Winter	30	+0%	100/15 Summer	100/15 Winter		
1.004	03	15 Winter	30	+0%	30/15 Summer			
1.005	J3	15 Summer	30	+0%				
4.000	05	15 Winter	30	+0%	100/15 Summer			
4.001	J4	15 Winter	30	+0%				
4.002	06	15 Winter	30	+0%	30/15 Summer			

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	01	16.909	-0.086	0.000	0.31			11.8	OK
2.000	SW01	17.096	-0.724	0.000	0.04		6	1.2	OK
2.001	SW02	16.888	-0.071	0.000	0.14			2.6	OK
1.001	J1	16.878	0.009	0.000	0.49			18.0	SURCHARGED*
1.002	J2	16.801	0.000	0.000	0.50			21.2	SURCHARGED*
1.003	02	16.779	-0.731	0.000	0.25		7	32.9	OK
3.000	SW03	17.026	-0.584	0.000	0.17		8	6.3	OK
3.001	SW04	16.794	-0.716	0.000	0.07		7	6.2	OK
3.002	SW05	16.237	-0.013	0.000	0.29			7.9	OK
1.004	03	16.232	0.167	0.000	1.24			35.3	SURCHARGED
1.005	J3	16.055	0.000	0.000	0.93			34.1	SURCHARGED*
4.000	05	15.972	-0.073	0.000	0.11			4.1	OK
4.001	J4	15.949	0.000	0.000	0.18			6.9	SURCHARGED*
4.002	06	15.963	0.088	0.000	0.32			9.2	SURCHARGED

PN	US/MH Name	Level Exceeded
1.000	01	
2.000	SW01	
2.001	SW02	
1.001	J1	
1.002	J2	
1.003	02	
3.000	SW03	
3.001	SW04	
3.002	SW05	1
1.004	03	
1.005	J3	
4.000	05	
4.001	J4	
4.002	06	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.006	04	15 Winter	30	+0%	30/15 Summer			
5.000	EX 15	15 Winter	30	+0%				
5.001	Ex 16	15 Winter	30	+0%	100/15 Winter			
1.007	07	15 Winter	30	+0%	100/15 Summer			
1.008	J5	15 Winter	30	+0%				
1.009	J6	15 Winter	30	+0%				
1.010	Ex 18	15 Winter	30	+0%	100/15 Summer			
6.000	Ex .39	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
6.001	Ex 38	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
6.002	Ex 37	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
6.003	Ex 36	15 Winter	30	+0%	30/15 Summer			
6.004	Ex J1	15 Summer	30	+0%				
6.005	Ex J2	15 Winter	30	+0%				
6.006	Ex 35	15 Winter	30	+0%				
6.007	08	15 Winter	30	+0%	100/15 Summer	100/15 Summer		
1.011	09	15 Winter	30	+0%	100/15 Summer			
7.000	15	15 Winter	30	+0%				
7.001	16	15 Winter	30	+0%				
8.000	17	15 Winter	30	+0%				
8.001	18	15 Winter	30	+0%				
1.012	10	15 Winter	30	+0%	100/15 Winter			
9.000	19	15 Winter	30	+0%				
9.001	20	30 Winter	30	+0%				
10.000	21	360 Winter	30	+0%	100/180 Winter	100/360 Winter		
10.001	22	360 Winter	30	+0%	30/240 Winter	100/240 Winter		
1.013	11	360 Winter	30	+0%				
1.014	12	360 Winter	30	+0%	1/30 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.006	04	15.959	0.114	0.000	1.31			44.8	SURCHARGED
5.000	EX 15	16.028	-0.187	0.000	0.07			3.5	OK
5.001	Ex 16	15.848	-0.157	0.000	0.20			14.2	OK
1.007	07	15.589	-0.086	0.000	0.69			61.6	OK
1.008	J5	15.184	-0.090	0.000	0.66			64.1	OK*
1.009	J6	14.744	-0.058	0.000	0.90			67.4	OK*
1.010	Ex 18	14.425	-0.096	0.000	0.62			70.6	OK
6.000	Ex .39	17.468	0.208	0.000	0.74			4.3	FLOOD RISK
6.001	Ex 38	17.391	0.451	0.000	0.91			7.6	FLOOD RISK
6.002	Ex 37	17.202	0.682	0.000	1.47			14.0	FLOOD RISK
6.003	Ex 36	16.169	0.129	0.000	1.02			15.8	SURCHARGED
6.004	Ex J1	15.633	0.000	0.000	1.11			16.8	SURCHARGED*
6.005	Ex J2	15.200	-0.025	0.000	0.91			19.0	OK*
6.006	Ex 35	14.378	-0.157	0.000	0.20			19.0	OK
6.007	08	13.972	-0.102	0.000	0.57			40.3	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.011	09	13.679	-0.046	0.000	0.97			119.9	OK
7.000	15	13.052	-0.243	0.000	0.08		6	11.3	OK
7.001	16	12.718	-0.167	0.000	0.15			11.1	OK
8.000	17	13.034	-0.261	0.000	0.04		6	5.2	OK
8.001	18	12.702	-0.183	0.000	0.08			6.4	OK
1.012	10	12.150	-0.074	0.000	0.77			127.1	OK
9.000	19	12.132	-0.458	0.000	0.02		5	8.5	OK
9.001	20	11.717	-0.188	0.000	0.06			11.4	OK
10.000	21	10.462	-0.298	0.000	0.00		344	0.7	OK
10.001	22	10.463	0.018	0.000	0.01			1.1	SURCHARGED
1.013	11	10.463	-0.408	0.000	0.01			15.0	OK
1.014	12	10.463	0.317	0.000	0.09			2.9	SURCHARGED

PN	US/MH Name	Level Exceeded
1.006	04	
5.000	EX 15	
5.001	Ex 16	
1.007	07	
1.008	J5	
1.009	J6	
1.010	Ex 18	
6.000	Ex .39	6
6.001	Ex 38	6
6.002	Ex 37	5
6.003	Ex 36	
6.004	Ex J1	
6.005	Ex J2	
6.006	Ex 35	
6.007	08	2
1.011	09	
7.000	15	
7.001	16	
8.000	17	
8.001	18	
1.012	10	
9.000	19	
9.001	20	
10.000	21	
10.001	22	7
1.013	11	
1.014	12	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	9
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.440
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	0

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	01	15 Winter	100	+0%	100/15 Summer				17.041
2.000	SW01	15 Winter	100	+0%					17.110
2.001	SW02	15 Winter	100	+0%	100/15 Summer				17.014
1.001	J1	15 Summer	100	+0%	100/15 Summer				16.878
1.002	J2	15 Summer	100	+0%					16.801
1.003	02	15 Winter	100	+0%					16.837
3.000	SW03	15 Winter	100	+0%					17.062
3.001	SW04	15 Winter	100	+0%					16.808
3.002	SW05	15 Winter	100	+0%	100/15 Summer				16.483
1.004	03	15 Winter	100	+0%	100/15 Summer				16.476
1.005	J3	15 Summer	100	+0%					16.055
4.000	05	15 Winter	100	+0%	100/15 Summer				16.136
4.001	J4	15 Summer	100	+0%					15.949
4.002	06	15 Winter	100	+0%	100/15 Summer				16.121

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	01	0.046	0.000	0.40			15.1	SURCHARGED	
2.000	SW01	-0.710	0.000	0.07		6	2.2	OK	
2.001	SW02	0.055	0.000	0.23			4.3	SURCHARGED	
1.001	J1	0.009	0.000	0.61			22.4	SURCHARGED*	
1.002	J2	0.000	0.000	0.63			26.9	SURCHARGED*	
1.003	02	-0.673	0.000	0.31		7	40.6	OK	
3.000	SW03	-0.548	0.000	0.22		8	8.0	OK	
3.001	SW04	-0.702	0.000	0.10		7	9.2	OK	
3.002	SW05	0.233	0.000	0.46			12.3	SURCHARGED	
1.004	03	0.411	0.000	1.51			43.0	SURCHARGED	
1.005	J3	0.000	0.000	1.14			41.6	SURCHARGED*	
4.000	05	0.091	0.000	0.13			4.9	SURCHARGED	
4.001	J4	0.000	0.000	0.18			6.9	SURCHARGED*	
4.002	06	0.246	0.000	0.40			11.5	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.006	04	15 Winter	100	+0%	100/15 Summer			
5.000	EX 15	15 Winter	100	+0%				
5.001	Ex 16	15 Winter	100	+0%				
1.007	07	15 Winter	100	+0%				
1.008	J5	15 Winter	100	+0%				
1.009	J6	15 Summer	100	+0%				
1.010	Ex 18	15 Winter	100	+0%				
6.000	Ex .39	15 Winter	100	+0%	100/15 Summer	100/15 Summer		
6.001	Ex 38	15 Winter	100	+0%	100/15 Summer	100/15 Summer		
6.002	Ex 37	15 Winter	100	+0%	100/15 Summer	100/15 Summer		
6.003	Ex 36	15 Winter	100	+0%	100/15 Summer			
6.004	Ex J1	15 Summer	100	+0%				
6.005	Ex J2	15 Winter	100	+0%				
6.006	Ex 35	15 Winter	100	+0%				
6.007	08	15 Winter	100	+0%	100/15 Summer			
1.011	09	15 Winter	100	+0%	100/15 Summer			
7.000	15	15 Winter	100	+0%				
7.001	16	15 Winter	100	+0%				
8.000	17	15 Winter	100	+0%				
8.001	18	15 Winter	100	+0%				
1.012	10	15 Winter	100	+0%				
9.000	19	15 Winter	100	+0%				
9.001	20	15 Winter	100	+0%				
10.000	21	480 Winter	100	+0%				
10.001	22	480 Winter	100	+0%	100/60 Winter			
1.013	11	480 Winter	100	+0%				
1.014	12	480 Winter	100	+0%	100/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.006	04	16.113	0.268	0.000	1.59			54.7	SURCHARGED
5.000	EX 15	16.035	-0.180	0.000	0.09			4.5	OK
5.001	Ex 16	15.858	-0.147	0.000	0.26			18.4	OK
1.007	07	15.616	-0.059	0.000	0.87			77.9	OK
1.008	J5	15.209	-0.065	0.000	0.83			80.8	OK*
1.009	J6	14.802	0.000	0.000	1.07			79.6	SURCHARGED*
1.010	Ex 18	14.471	-0.050	0.000	0.77			87.4	OK
6.000	Ex .39	17.491	0.231	0.579	0.73			4.2	FLOOD
6.001	Ex 38	17.411	0.471	1.420	1.17			9.9	FLOOD
6.002	Ex 37	17.380	0.860	0.328	1.52			14.5	FLOOD
6.003	Ex 36	16.318	0.278	0.000	1.09			16.8	SURCHARGED
6.004	Ex J1	15.633	0.000	0.000	1.20			18.3	SURCHARGED*
6.005	Ex J2	15.219	-0.005	0.000	1.00			20.8	OK*
6.006	Ex 35	14.380	-0.154	0.000	0.22			20.8	OK
6.007	08	14.158	0.083	0.000	0.65			46.1	FLOOD RISK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.011	09	14.038	0.313	0.000	1.10			135.9	SURCHARGED
7.000	15	13.061	-0.234	0.000	0.10		6	14.9	OK
7.001	16	12.729	-0.156	0.000	0.20			14.8	OK
8.000	17	13.039	-0.256	0.000	0.05		6	6.8	OK
8.001	18	12.707	-0.178	0.000	0.10			8.3	OK
1.012	10	12.162	-0.062	0.000	0.87			143.1	OK
9.000	19	12.138	-0.452	0.000	0.02		6	11.4	OK
9.001	20	11.725	-0.180	0.000	0.09			15.4	OK
10.000	21	10.597	-0.163	0.000	0.00			0.7	FLOOD RISK
10.001	22	10.597	0.152	0.000	0.01			0.9	FLOOD RISK
1.013	11	10.597	-0.274	0.000	0.01			14.5	OK
1.014	12	10.597	0.451	0.000	0.09			2.9	SURCHARGED

PN	US/MH Name	Level Exceeded
1.006	04	
5.000	EX 15	
5.001	Ex 16	
1.007	07	
1.008	J5	
1.009	J6	
1.010	Ex 18	
6.000	Ex .39	4
6.001	Ex 38	4
6.002	Ex 37	2
6.003	Ex 36	
6.004	Ex J1	
6.005	Ex J2	
6.006	Ex 35	
6.007	08	
1.011	09	
7.000	15	
7.001	16	
8.000	17	
8.001	18	
1.012	10	
9.000	19	
9.001	20	
10.000	21	
10.001	22	
1.013	11	
1.014	12	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	9
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.440
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	01	15 Winter	100	+40%	100/15 Summer			
2.000	SW01	15 Winter	100	+40%				
2.001	SW02	15 Winter	100	+40%	100/15 Summer			
1.001	J1	15 Summer	100	+40%	30/15 Summer			
1.002	J2	15 Summer	100	+40%				
1.003	02	15 Winter	100	+40%				
3.000	SW03	15 Winter	100	+40%				
3.001	SW04	15 Winter	100	+40%				
3.002	SW05	15 Winter	100	+40%	100/15 Summer	100/15 Winter		
1.004	03	15 Winter	100	+40%	30/15 Summer			
1.005	J3	15 Summer	100	+40%				
4.000	05	15 Winter	100	+40%	100/15 Summer			
4.001	J4	15 Summer	100	+40%				
4.002	06	15 Winter	100	+40%	30/15 Summer			

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	01	17.236	0.241	0.000	0.58			22.1	SURCHARGED
2.000	SW01	17.172	-0.648	0.000	0.12		5	3.7	OK
2.001	SW02	17.167	0.208	0.000	0.32			6.1	SURCHARGED
1.001	J1	16.878	0.009	0.000	0.86			31.7	SURCHARGED*
1.002	J2	16.801	0.000	0.000	0.89			38.0	SURCHARGED*
1.003	02	16.987	-0.523	0.000	0.38		8	50.0	OK
3.000	SW03	17.114	-0.496	0.000	0.31		8	11.4	OK
3.001	SW04	16.927	-0.583	0.000	0.18		6	17.1	OK
3.002	SW05	16.901	0.651	1.193	0.84			22.6	FLOOD
1.004	03	16.916	0.851	0.000	1.82			51.8	FLOOD RISK
1.005	J3	16.055	0.000	0.000	1.39			50.8	SURCHARGED*
4.000	05	16.631	0.586	0.000	0.16			6.3	SURCHARGED
4.001	J4	15.949	0.000	0.000	0.26			10.0	SURCHARGED*
4.002	06	16.611	0.736	0.000	0.52			14.9	FLOOD RISK

PN	US/MH Name	Level Exceeded
1.000	01	
2.000	SW01	
2.001	SW02	
1.001	J1	
1.002	J2	
1.003	02	
3.000	SW03	
3.001	SW04	
3.002	SW05	1
1.004	03	
1.005	J3	
4.000	05	
4.001	J4	
4.002	06	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.006	04	15 Winter	100	+40%	30/15 Summer			
5.000	EX 15	15 Winter	100	+40%				
5.001	Ex 16	15 Winter	100	+40%	100/15 Winter			
1.007	07	15 Winter	100	+40%	100/15 Summer			
1.008	J5	15 Summer	100	+40%				
1.009	J6	15 Summer	100	+40%				
1.010	Ex 18	15 Winter	100	+40%	100/15 Summer			
6.000	Ex .39	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
6.001	Ex 38	30 Winter	100	+40%	30/15 Summer	100/15 Summer		
6.002	Ex 37	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
6.003	Ex 36	15 Winter	100	+40%	30/15 Summer			
6.004	Ex J1	15 Summer	100	+40%				
6.005	Ex J2	15 Summer	100	+40%				
6.006	Ex 35	15 Summer	100	+40%				
6.007	08	15 Winter	100	+40%	100/15 Summer	100/15 Summer		
1.011	09	15 Winter	100	+40%	100/15 Summer			
7.000	15	15 Winter	100	+40%				
7.001	16	15 Winter	100	+40%				
8.000	17	15 Winter	100	+40%				
8.001	18	15 Winter	100	+40%				
1.012	10	15 Winter	100	+40%	100/15 Winter			
9.000	19	15 Winter	100	+40%				
9.001	20	15 Winter	100	+40%				
10.000	21	720 Winter	100	+40%	100/180 Winter	100/360 Winter		
10.001	22	720 Winter	100	+40%	30/240 Winter	100/240 Winter		
1.013	11	480 Winter	100	+40%				
1.014	12	480 Winter	100	+40%	1/30 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.006	04	16.601	0.756	0.000	1.75			59.9	FLOOD RISK
5.000	EX 15	16.115	-0.100	0.000	0.12			6.3	OK
5.001	Ex 16	16.108	0.103	0.000	0.36			25.8	SURCHARGED
1.007	07	16.083	0.408	0.000	0.96			86.1	SURCHARGED
1.008	J5	15.274	0.000	0.000	0.90			86.7	SURCHARGED*
1.009	J6	14.802	0.000	0.000	1.21			90.1	SURCHARGED*
1.010	Ex 18	14.869	0.348	0.000	0.86			96.8	SURCHARGED
6.000	Ex .39	17.492	0.232	1.751	0.72			4.2	FLOOD
6.001	Ex 38	17.414	0.474	3.933	1.30			10.9	FLOOD
6.002	Ex 37	17.382	0.862	2.477	1.57			15.0	FLOOD
6.003	Ex 36	16.516	0.476	0.000	1.09			16.8	SURCHARGED
6.004	Ex J1	15.633	0.000	0.000	1.27			19.4	SURCHARGED*
6.005	Ex J2	15.225	0.000	0.000	1.07			22.3	SURCHARGED*
6.006	Ex 35	14.467	-0.067	0.000	0.24			22.9	OK
6.007	08	14.452	0.377	1.684	0.70			49.8	FLOOD

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.011	09	14.359	0.634	0.000	1.19			147.2	FLOOD RISK
7.000	15	13.075	-0.220	0.000	0.15		6	21.2	OK
7.001	16	12.742	-0.143	0.000	0.28			20.8	FLOOD RISK
8.000	17	13.048	-0.247	0.000	0.07		6	9.9	OK
8.001	18	12.715	-0.170	0.000	0.14			11.5	OK
1.012	10	12.341	0.117	0.000	1.03			169.2	SURCHARGED
9.000	19	12.146	-0.444	0.000	0.03		6	16.2	OK
9.001	20	11.735	-0.170	0.000	0.13			23.1	OK
10.000	21	10.818	0.058	12.402	0.01			1.6	FLOOD
10.001	22	10.819	0.374	18.734	0.03			2.3	FLOOD
1.013	11	10.824	-0.047	0.000	0.01			18.2	OK
1.014	12	10.824	0.678	0.000	0.09			2.9	SURCHARGED

PN	US/MH Name	Level Exceeded
1.006	04	
5.000	EX 15	
5.001	Ex 16	
1.007	07	
1.008	J5	
1.009	J6	
1.010	Ex 18	
6.000	Ex .39	6
6.001	Ex 38	6
6.002	Ex 37	5
6.003	Ex 36	
6.004	Ex J1	
6.005	Ex J2	
6.006	Ex 35	
6.007	08	2
1.011	09	
7.000	15	
7.001	16	
8.000	17	
8.001	18	
1.012	10	
9.000	19	
9.001	20	
10.000	21	
10.001	22	7
1.013	11	
1.014	12	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.447	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.447		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.440
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	360
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)
1.000	01	360 minute 1 year Winter I+0%	17.770	16.790	0.000	0.004	6.178	0.7
2.000	SW01	360 minute 1 year Winter I+0%	17.820	17.039	0.000	0.002	0.633	0.1
2.001	SW02	360 minute 1 year Winter I+0%	17.610	16.765	0.000	0.000	1.441	0.2
1.001	J1	360 minute 1 year Winter I+0%	17.640	16.620	0.000	0.024	9.924	1.2
1.002	J2	360 minute 1 year Winter I+0%	17.575	16.552	0.000	0.043	12.146	1.4
1.003	02	360 minute 1 year Winter I+0%	17.510	16.405	0.000	0.016	18.714	2.2
3.000	SW03	360 minute 1 year Winter I+0%	17.610	16.854	0.000	0.006	3.594	0.4
3.001	SW04	360 minute 1 year Winter I+0%	17.510	16.736	0.000	0.040	3.594	0.4
3.002	SW05	360 minute 1 year Winter I+0%	16.900	16.115	0.000	0.004	5.282	0.6
1.004	03	360 minute 1 year Winter I+0%	16.950	15.887	0.000	0.125	23.940	2.8
1.005	J3	360 minute 1 year Winter I+0%	16.805	15.873	0.000	0.046	25.367	3.0
4.000	05	360 minute 1 year Winter I+0%	18.820	15.827	0.000	0.001	2.114	0.2
4.001	J4	360 minute 1 year Winter I+0%	17.850	15.737	0.000	0.016	4.099	0.5
4.002	06	360 minute 1 year Winter I+0%	16.880	15.679	0.000	0.029	6.038	0.7
1.006	04	360 minute 1 year Winter I+0%	16.810	15.672	0.000	0.100	36.186	4.2
5.000	EX 15	360 minute 1 year Winter I+0%	16.830	15.994	0.000	0.000	1.729	0.2
5.001	Ex 16	360 minute 1 year Winter I+0%	16.980	15.792	0.000	0.011	6.715	0.8
1.007	07	360 minute 1 year Winter I+0%	17.370	15.487	0.000	0.099	48.793	5.7
1.008	J5	360 minute 1 year Winter I+0%	16.285	15.085	0.000	0.033	50.182	5.9

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status
1.000	01	OK
2.000	SW01	OK
2.001	SW02	OK
1.001	J1	OK*
1.002	J2	OK*
1.003	02	OK
3.000	SW03	OK
3.001	SW04	OK
3.002	SW05	OK
1.004	03	OK
1.005	J3	OK*
4.000	05	OK
4.001	J4	OK*
4.002	06	OK
1.006	04	OK
5.000	EX 15	OK
5.001	Ex 16	OK
1.007	07	OK
1.008	J5	OK*

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Maximum Vol (m³)	Discharge Vol (m³)
1.009	J6	360 minute 1 year Winter I+0%	15.743	14.620	0.000	0.041	52.007
1.010	Ex 18	360 minute 1 year Winter I+0%	15.400	14.330	0.000	0.036	53.815
6.000	Ex .39	360 minute 1 year Winter I+0%	17.490	17.176	0.000	0.012	2.917
6.001	Ex 38	360 minute 1 year Winter I+0%	17.410	16.859	0.000	0.022	5.962
6.002	Ex 37	360 minute 1 year Winter I+0%	17.380	16.446	0.000	0.027	12.469
6.003	Ex 36	360 minute 1 year Winter I+0%	16.880	15.962	0.000	0.021	13.960
6.004	Ex J1	360 minute 1 year Winter I+0%	16.540	15.555	0.000	0.018	15.063
6.005	Ex J2	360 minute 1 year Winter I+0%	16.200	15.145	0.000	0.016	16.232
6.006	Ex 35	360 minute 1 year Winter I+0%	15.520	14.331	0.000	0.018	16.231
6.007	08	360 minute 1 year Winter I+0%	14.450	13.879	0.000	0.036	26.428
1.011	09	360 minute 1 year Winter I+0%	14.400	13.542	0.000	0.064	85.656
7.000	15	360 minute 1 year Winter I+0%	13.380	13.046	0.000	0.007	6.352
7.001	16	360 minute 1 year Winter I+0%	13.040	12.671	0.000	0.005	6.351
8.000	17	360 minute 1 year Winter I+0%	13.380	13.037	0.000	0.005	3.064
8.001	18	360 minute 1 year Winter I+0%	13.030	12.594	0.000	0.001	6.029
1.012	10	360 minute 1 year Winter I+0%	12.700	11.963	0.000	0.056	98.035
9.000	19	360 minute 1 year Winter I+0%	12.680	12.136	0.000	0.045	4.673
9.001	20	360 minute 1 year Winter I+0%	12.260	11.686	0.000	0.003	9.152
10.000	21	360 minute 1 year Winter I+0%	10.850	10.325	0.000	0.072	4.186
10.001	22	360 minute 1 year Winter I+0%	10.800	10.233	0.000	0.046	7.314
1.013	11	360 minute 1 year Winter I+0%	11.520	10.071	0.000	0.914	113.732
1.014	12	360 minute 1 year Winter I+0%	12.010	10.064	0.000	12.958	102.255

PN	US/MH Name	Pipe Flow (l/s)	Status
1.009	J6	6.1	OK*
1.010	Ex 18	6.3	OK
6.000	Ex .39	0.3	OK
6.001	Ex 38	0.7	OK
6.002	Ex 37	1.5	OK
6.003	Ex 36	1.6	OK
6.004	Ex J1	1.8	OK*
6.005	Ex J2	1.9	OK*
6.006	Ex 35	1.9	OK
6.007	08	3.1	OK
1.011	09	10.0	OK
7.000	15	0.7	OK
7.001	16	0.7	OK
8.000	17	0.4	OK
8.001	18	0.7	OK
1.012	10	11.5	OK
9.000	19	0.5	OK
9.001	20	1.1	OK
10.000	21	0.5	OK
10.001	22	0.9	OK

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status
1.013	11	13.4	OK
1.014	12	13.4	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.440
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	360
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)
1.000	01	360 minute 30 year Winter I+0%	17.770	16.800	0.000	0.007	13.720	1.6
2.000	SW01	360 minute 30 year Winter I+0%	17.820	17.048	0.000	0.004	1.405	0.2
2.001	SW02	360 minute 30 year Winter I+0%	17.610	16.773	0.000	0.002	3.200	0.4
1.001	J1	360 minute 30 year Winter I+0%	17.640	16.633	0.000	0.038	22.039	2.6
1.002	J2	360 minute 30 year Winter I+0%	17.575	16.566	0.000	0.071	26.972	3.2
1.003	02	360 minute 30 year Winter I+0%	17.510	16.433	0.000	0.025	41.556	4.9
3.000	SW03	360 minute 30 year Winter I+0%	17.610	16.876	0.000	0.010	7.980	0.9
3.001	SW04	360 minute 30 year Winter I+0%	17.510	16.750	0.000	0.065	7.980	0.9
3.002	SW05	360 minute 30 year Winter I+0%	16.900	16.122	0.000	0.007	11.730	1.4
1.004	03	360 minute 30 year Winter I+0%	16.950	15.911	0.000	0.161	53.230	6.2
1.005	J3	360 minute 30 year Winter I+0%	16.805	15.894	0.000	0.073	56.398	6.6
4.000	05	360 minute 30 year Winter I+0%	18.820	15.835	0.000	0.003	4.694	0.5
4.001	J4	360 minute 30 year Winter I+0%	17.850	15.749	0.000	0.039	9.104	1.1
4.002	06	360 minute 30 year Winter I+0%	16.880	15.703	0.000	0.058	13.409	1.6
1.006	04	360 minute 30 year Winter I+0%	16.810	15.700	0.000	0.158	80.425	9.4
5.000	EX 15	360 minute 30 year Winter I+0%	16.830	15.999	0.000	0.005	3.840	0.4
5.001	Ex 16	360 minute 30 year Winter I+0%	16.980	15.804	0.000	0.031	14.912	1.7
1.007	07	360 minute 30 year Winter I+0%	17.370	15.506	0.000	0.159	108.423	12.7
1.008	J5	360 minute 30 year Winter I+0%	16.285	15.104	0.000	0.054	111.508	13.0

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status
1.000	01	OK
2.000	SW01	OK
2.001	SW02	OK
1.001	J1	OK*
1.002	J2	OK*
1.003	02	OK
3.000	SW03	OK
3.001	SW04	OK
3.002	SW05	OK
1.004	03	OK
1.005	J3	OK*
4.000	05	OK
4.001	J4	OK*
4.002	06	OK
1.006	04	OK
5.000	EX 15	OK
5.001	Ex 16	OK
1.007	07	OK
1.008	J5	OK*

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Maximum Vol (m³)	Discharge Vol (m³)
1.009	J6	360 minute 30 year Winter I+0%	15.743	14.641	0.000	0.065	115.559
1.010	Ex 18	360 minute 30 year Winter I+0%	15.400	14.348	0.000	0.059	119.576
6.000	Ex .39	360 minute 30 year Winter I+0%	17.490	17.184	0.000	0.021	6.478
6.001	Ex 38	360 minute 30 year Winter I+0%	17.410	16.869	0.000	0.036	13.240
6.002	Ex 37	360 minute 30 year Winter I+0%	17.380	16.460	0.000	0.046	27.687
6.003	Ex 36	360 minute 30 year Winter I+0%	16.880	15.973	0.000	0.035	30.999
6.004	Ex J1	360 minute 30 year Winter I+0%	16.540	15.567	0.000	0.031	33.450
6.005	Ex J2	360 minute 30 year Winter I+0%	16.200	15.155	0.000	0.027	36.045
6.006	Ex 35	360 minute 30 year Winter I+0%	15.520	14.340	0.000	0.029	36.045
6.007	08	360 minute 30 year Winter I+0%	14.450	13.896	0.000	0.061	58.688
1.011	09	360 minute 30 year Winter I+0%	14.400	13.564	0.000	0.101	190.284
7.000	15	360 minute 30 year Winter I+0%	13.380	13.070	0.000	0.010	14.105
7.001	16	360 minute 30 year Winter I+0%	13.040	12.683	0.000	0.016	14.104
8.000	17	360 minute 30 year Winter I+0%	13.380	13.056	0.000	0.008	6.803
8.001	18	360 minute 30 year Winter I+0%	13.030	12.605	0.000	0.003	13.388
1.012	10	360 minute 30 year Winter I+0%	12.700	11.983	0.000	0.090	217.776
9.000	19	360 minute 30 year Winter I+0%	12.680	12.155	0.000	0.072	10.377
9.001	20	360 minute 30 year Winter I+0%	12.260	11.694	0.000	0.018	20.326
10.000	21	360 minute 30 year Winter I+0%	10.850	10.354	0.000	0.113	9.294
10.001	22	360 minute 30 year Winter I+0%	10.800	10.244	0.000	0.113	16.243
1.013	11	360 minute 30 year Winter I+0%	11.520	10.143	0.000	1.069	253.572
1.014	12	360 minute 30 year Winter I+0%	12.010	10.111	0.000	13.897	242.098

PN	US/MH Name	Pipe Flow (l/s)	Status
1.009	J6	13.5	OK*
1.010	Ex 18	14.0	OK
6.000	Ex .39	0.8	OK
6.001	Ex 38	1.5	OK
6.002	Ex 37	3.2	OK
6.003	Ex 36	3.6	OK
6.004	Ex J1	3.9	OK*
6.005	Ex J2	4.2	OK*
6.006	Ex 35	4.2	OK
6.007	08	6.9	OK
1.011	09	22.2	OK
7.000	15	1.7	OK
7.001	16	1.7	OK
8.000	17	0.8	OK
8.001	18	1.6	OK
1.012	10	25.5	OK
9.000	19	1.2	OK
9.001	20	2.4	OK
10.000	21	1.1	OK
10.001	22	1.9	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status
1.013	11	29.7	OK
1.014	12	29.7	OK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	9
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.440
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	0

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	01	15 Winter	100	+0%	100/15 Summer				17.041
2.000	SW01	15 Winter	100	+0%					17.110
2.001	SW02	15 Winter	100	+0%	100/15 Summer				17.014
1.001	J1	15 Summer	100	+0%	100/15 Summer				16.878
1.002	J2	15 Summer	100	+0%					16.801
1.003	02	15 Winter	100	+0%					16.837
3.000	SW03	15 Winter	100	+0%					17.062
3.001	SW04	15 Winter	100	+0%					16.808
3.002	SW05	15 Winter	100	+0%	100/15 Summer				16.483
1.004	03	15 Winter	100	+0%	100/15 Summer				16.476
1.005	J3	15 Summer	100	+0%					16.055
4.000	05	15 Winter	100	+0%	100/15 Summer				16.136
4.001	J4	15 Summer	100	+0%					15.949
4.002	06	15 Winter	100	+0%	100/15 Summer				16.121

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	01	0.046	0.000	0.40			15.1	SURCHARGED	
2.000	SW01	-0.710	0.000	0.07		6	2.2	OK	
2.001	SW02	0.055	0.000	0.23			4.3	SURCHARGED	
1.001	J1	0.009	0.000	0.61			22.4	SURCHARGED*	
1.002	J2	0.000	0.000	0.63			26.9	SURCHARGED*	
1.003	02	-0.673	0.000	0.31		7	40.6	OK	
3.000	SW03	-0.548	0.000	0.22		8	8.0	OK	
3.001	SW04	-0.702	0.000	0.10		7	9.2	OK	
3.002	SW05	0.233	0.000	0.46			12.3	SURCHARGED	
1.004	03	0.411	0.000	1.51			43.0	SURCHARGED	
1.005	J3	0.000	0.000	1.14			41.6	SURCHARGED*	
4.000	05	0.091	0.000	0.13			4.9	SURCHARGED	
4.001	J4	0.000	0.000	0.18			6.9	SURCHARGED*	
4.002	06	0.246	0.000	0.40			11.5	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.006	04	15 Winter	100	+0%	100/15 Summer			
5.000	EX 15	15 Winter	100	+0%				
5.001	Ex 16	15 Winter	100	+0%				
1.007	07	15 Winter	100	+0%				
1.008	J5	15 Winter	100	+0%				
1.009	J6	15 Summer	100	+0%				
1.010	Ex 18	15 Winter	100	+0%				
6.000	Ex .39	15 Winter	100	+0%	100/15 Summer	100/15 Summer		
6.001	Ex 38	15 Winter	100	+0%	100/15 Summer	100/15 Summer		
6.002	Ex 37	15 Winter	100	+0%	100/15 Summer	100/15 Summer		
6.003	Ex 36	15 Winter	100	+0%	100/15 Summer			
6.004	Ex J1	15 Summer	100	+0%				
6.005	Ex J2	15 Winter	100	+0%				
6.006	Ex 35	15 Winter	100	+0%				
6.007	08	15 Winter	100	+0%	100/15 Summer			
1.011	09	15 Winter	100	+0%	100/15 Summer			
7.000	15	15 Winter	100	+0%				
7.001	16	15 Winter	100	+0%				
8.000	17	15 Winter	100	+0%				
8.001	18	15 Winter	100	+0%				
1.012	10	15 Winter	100	+0%				
9.000	19	15 Winter	100	+0%				
9.001	20	15 Winter	100	+0%				
10.000	21	480 Winter	100	+0%				
10.001	22	480 Winter	100	+0%	100/60 Winter			
1.013	11	480 Winter	100	+0%				
1.014	12	480 Winter	100	+0%	100/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.006	04	16.113	0.268	0.000	1.59			54.7	SURCHARGED
5.000	EX 15	16.035	-0.180	0.000	0.09			4.5	OK
5.001	Ex 16	15.858	-0.147	0.000	0.26			18.4	OK
1.007	07	15.616	-0.059	0.000	0.87			77.9	OK
1.008	J5	15.209	-0.065	0.000	0.83			80.8	OK*
1.009	J6	14.802	0.000	0.000	1.07			79.6	SURCHARGED*
1.010	Ex 18	14.471	-0.050	0.000	0.77			87.4	OK
6.000	Ex .39	17.491	0.231	0.579	0.73			4.2	FLOOD
6.001	Ex 38	17.411	0.471	1.420	1.17			9.9	FLOOD
6.002	Ex 37	17.380	0.860	0.328	1.52			14.5	FLOOD
6.003	Ex 36	16.318	0.278	0.000	1.09			16.8	SURCHARGED
6.004	Ex J1	15.633	0.000	0.000	1.20			18.3	SURCHARGED*
6.005	Ex J2	15.219	-0.005	0.000	1.00			20.8	OK*
6.006	Ex 35	14.380	-0.154	0.000	0.22			20.8	OK
6.007	08	14.158	0.083	0.000	0.65			46.1	FLOOD RISK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.011	09	14.038	0.313	0.000	1.10			135.9	SURCHARGED
7.000	15	13.061	-0.234	0.000	0.10		6	14.9	OK
7.001	16	12.729	-0.156	0.000	0.20			14.8	OK
8.000	17	13.039	-0.256	0.000	0.05		6	6.8	OK
8.001	18	12.707	-0.178	0.000	0.10			8.3	OK
1.012	10	12.162	-0.062	0.000	0.87			143.1	OK
9.000	19	12.138	-0.452	0.000	0.02		6	11.4	OK
9.001	20	11.725	-0.180	0.000	0.09			15.4	OK
10.000	21	10.597	-0.163	0.000	0.00			0.7	FLOOD RISK
10.001	22	10.597	0.152	0.000	0.01			0.9	FLOOD RISK
1.013	11	10.597	-0.274	0.000	0.01			14.5	OK
1.014	12	10.597	0.451	0.000	0.09			2.9	SURCHARGED

PN	US/MH Name	Level Exceeded
1.006	04	
5.000	EX 15	
5.001	Ex 16	
1.007	07	
1.008	J5	
1.009	J6	
1.010	Ex 18	
6.000	Ex .39	4
6.001	Ex 38	4
6.002	Ex 37	2
6.003	Ex 36	
6.004	Ex J1	
6.005	Ex J2	
6.006	Ex 35	
6.007	08	
1.011	09	
7.000	15	
7.001	16	
8.000	17	
8.001	18	
1.012	10	
9.000	19	
9.001	20	
10.000	21	
10.001	22	
1.013	11	
1.014	12	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.440
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	360
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Maximum Vol (m³)	Discharge Vol (m³)
1.000	01	360 minute 100 year Winter I+40%	17.770	16.811	0.000	0.010	24.964
2.000	SW01	360 minute 100 year Winter I+40%	17.820	17.059	0.000	0.005	2.556
2.001	SW02	360 minute 100 year Winter I+40%	17.610	16.777	0.000	0.003	5.822
1.001	J1	360 minute 100 year Winter I+40%	17.640	16.647	0.000	0.054	40.101
1.002	J2	360 minute 100 year Winter I+40%	17.575	16.580	0.000	0.100	49.078
1.003	02	360 minute 100 year Winter I+40%	17.510	16.465	0.000	0.054	75.615
3.000	SW03	360 minute 100 year Winter I+40%	17.610	16.900	0.000	0.014	14.521
3.001	SW04	360 minute 100 year Winter I+40%	17.510	16.764	0.000	0.092	14.521
3.002	SW05	360 minute 100 year Winter I+40%	16.900	16.131	0.000	0.011	21.344
1.004	03	360 minute 100 year Winter I+40%	16.950	15.938	0.000	0.204	96.902
1.005	J3	360 minute 100 year Winter I+40%	16.805	15.919	0.000	0.103	102.668
4.000	05	360 minute 100 year Winter I+40%	18.820	15.844	0.000	0.005	8.541
4.001	J4	360 minute 100 year Winter I+40%	17.850	15.759	0.000	0.059	16.565
4.002	06	360 minute 100 year Winter I+40%	16.880	15.735	0.000	0.096	24.399
1.006	04	360 minute 100 year Winter I+40%	16.810	15.732	0.000	0.260	146.385
5.000	EX 15	360 minute 100 year Winter I+40%	16.830	16.007	0.000	0.013	6.987
5.001	Ex 16	360 minute 100 year Winter I+40%	16.980	15.810	0.000	0.042	27.134
1.007	07	360 minute 100 year Winter I+40%	17.370	15.527	0.000	0.225	197.331
1.008	J5	360 minute 100 year Winter I+40%	16.285	15.124	0.000	0.076	202.946

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status
1.000	01	2.9	OK
2.000	SW01	0.3	OK
2.001	SW02	0.7	OK
1.001	J1	4.7	OK*
1.002	J2	5.7	OK*
1.003	02	8.9	OK
3.000	SW03	1.7	OK
3.001	SW04	1.7	OK
3.002	SW05	2.5	OK
1.004	03	11.3	OK
1.005	J3	12.0	OK*
4.000	05	1.0	OK
4.001	J4	1.9	OK*
4.002	06	2.9	OK
1.006	04	17.1	OK
5.000	EX 15	0.8	OK
5.001	Ex 16	3.2	OK
1.007	07	23.1	OK
1.008	J5	23.7	OK*

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Maximum Vol (m³)	Discharge Vol (m³)
1.009	J6	360 minute 100 year Winter I+40%	15.743	14.666	0.000	0.092	210.317
1.010	Ex 18	360 minute 100 year Winter I+40%	15.400	14.368	0.000	0.083	217.625
6.000	Ex .39	360 minute 100 year Winter I+40%	17.490	17.193	0.000	0.032	11.788
6.001	Ex 38	360 minute 100 year Winter I+40%	17.410	16.880	0.000	0.053	24.091
6.002	Ex 37	360 minute 100 year Winter I+40%	17.380	16.477	0.000	0.068	50.379
6.003	Ex 36	360 minute 100 year Winter I+40%	16.880	15.986	0.000	0.052	56.404
6.004	Ex J1	360 minute 100 year Winter I+40%	16.540	15.581	0.000	0.045	60.864
6.005	Ex J2	360 minute 100 year Winter I+40%	16.200	15.166	0.000	0.039	65.587
6.006	Ex 35	360 minute 100 year Winter I+40%	15.520	14.352	0.000	0.042	65.586
6.007	08	360 minute 100 year Winter I+40%	14.450	13.913	0.000	0.085	106.787
1.011	09	360 minute 100 year Winter I+40%	14.400	13.588	0.000	0.142	346.284
7.000	15	360 minute 100 year Winter I+40%	13.380	13.097	0.000	0.015	25.665
7.001	16	360 minute 100 year Winter I+40%	13.040	12.689	0.000	0.021	25.664
8.000	17	360 minute 100 year Winter I+40%	13.380	13.080	0.000	0.012	12.379
8.001	18	360 minute 100 year Winter I+40%	13.030	12.612	0.000	0.004	24.362
1.012	10	360 minute 100 year Winter I+40%	12.700	12.005	0.000	0.127	396.310
9.000	19	360 minute 100 year Winter I+40%	12.680	12.176	0.000	0.102	18.882
9.001	20	360 minute 100 year Winter I+40%	12.260	11.704	0.000	0.037	36.986
10.000	21	360 minute 100 year Winter I+40%	10.850	10.659	0.000	0.550	16.911
10.001	22	360 minute 100 year Winter I+40%	10.800	10.644	0.000	3.034	29.556
1.013	11	360 minute 100 year Winter I+40%	11.520	10.640	0.000	2.184	462.065
1.014	12	360 minute 100 year Winter I+40%	12.010	10.616	0.000	16.108	450.593

PN	US/MH Name	Pipe Flow (l/s)	Status
1.009	J6	24.6	OK*
1.010	Ex 18	25.4	OK
6.000	Ex .39	1.4	FLOOD RISK
6.001	Ex 38	2.8	OK
6.002	Ex 37	5.9	OK
6.003	Ex 36	6.6	OK
6.004	Ex J1	7.1	OK*
6.005	Ex J2	7.7	OK*
6.006	Ex 35	7.7	OK
6.007	08	12.5	OK
1.011	09	40.5	OK
7.000	15	3.0	FLOOD RISK
7.001	16	3.0	OK
8.000	17	1.4	OK
8.001	18	2.9	OK
1.012	10	46.3	OK
9.000	19	2.2	OK
9.001	20	4.3	OK
10.000	21	2.2	FLOOD RISK
10.001	22	5.3	FLOOD RISK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status
1.013	11	53.6	SURCHARGED
1.014	12	53.6	SURCHARGED

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Appendix E

Surface Water Drainage Pro-Forma

LONDON BOROUGH OF BEXLEY
Trusted by Bexley residents

GREATER LONDON AUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Cornerstone School (formerly Woodside School)
Address & post code	Halt Robin Lane, Belvedere, DA17 6DW
OS Grid ref. (Easting, Northing)	E 549681
	N 178905
LPA reference (if applicable)	
Brief description of proposed work	Removal of 1970's extension & portakabin to the west of the site. New extension added to school building in location of 1970's building along with new play area (MUGA) and new parking.
Total site Area	8325 m^2
Total existing impervious area	6425 m^2
Total proposed impervious area	6494 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Gravity - 3 No. SW 1 No. to west & 2 No. to north
Designer Name	Daniel Harwood
Designer Position	Project Civil engineer
Designer Company	AKSWard

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Made Ground & Clayey River Terrace Deposits
Bedrock geology classification	Thanet Formation
Site infiltration rate	0 m/s
Depth to groundwater level	m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	N	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	Y	Y
7 discharge rainwater to the combined sewer.	N	N

2c. Proposed Discharge Details

Proposed discharge location	Existing Thames Water surface water sewer
Has the owner/regulator of the discharge location been consulted?	Thames water to be notified

LONDON BOROUGH OF BEXLEY
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GREATER LONDON AUTHORITY

LoDEG

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	2.9			
1 in 1	2.4	51.4	362.92	2.5
1 in 30	6.5	100.7	362.92	2.5
1 in 100	9.1	115.6	362.92	2.5
1 in 100 + CC			362.92	2.8
Climate change allowance used		40%		

3b. Principal Method of Flow Control	HydroBrake flow control device

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	0	0
Filter strips	1144	95.53	16.06
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	1642	1642	175.86
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	5539		171
Total	**8325**	**1737.53**	**362.92**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Appendix A
Drainage hierarchy (2b)	Drainage Strategy Report
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Appendix A
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Appendix D
Proposed SuDS measures & specifications (3b)	Appendix C
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	
Detailed drainage design drawings, including exceedance flow routes	Appendix C
Detailed landscaping plans	Appendix C
Maintenance strategy	Appendix F
Demonstration of how the proposed SuDS measures improve:	Drainage Strategy Report
a) water quality of the runoff?	
b) biodiversity?	
c) amenity?	

Appendix F

SuDS Maintenance Schedule

Cellular Tanks Operation & Maintenance Requirements

Regular inspection and maintenance is required to ensure the effective long-term operation of below ground modular storage systems.

Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements.

Modular systems – operation and maintenance requirements

Maintenance schedule	**Required action**	**Recommended Frequency**
Regular maintenance	Inspect and indentify any areas that are not operating correctly. If required, take remedial action	Monthly for three months then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae, or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pretreatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlets, overflows, and vents	As required
Monitoring	Inspect/check all inlets, outlets, overflows, and vents to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment buildup and remove if necessary	Every five years or as required

Maintenance activities should be detailed in the health and safety plan and a risk assessment should be undertaken.

Gravel Collection Trench Operation & Maintenance Requirements

Regular inspection and maintenance is important for the effective operation of collection trenches as designed.

Access for maintenance vehicles must be available, but this is not usually a constraint due to the likely location of the filter strip adjacent to impermeable areas.

Operation and maintenance requirements for collection trenches are described below.

Gravel collection Trench operation and maintenance requirements

Maintenance schedule	**Required action**	**Frequency**
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season) or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect trench surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (e.g. oils)	Monthly (at start, then half yearly)
	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly (at start, then half yearly)
Occasional maintenance	Reseed areas of poor vegetation growth ; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over >10% of the filter strip area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Re-level uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break-up silt deposits, and prevent compaction of the soil surface	As required
	Remove buildup of sediment on upstream gravel trench	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required
	Inspect gravel trench upstream for clogging	Half yearly
	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

Sediments excavated from a gravel trenches that receive runoff from commercial or standard road and roof areas are generally not toxic or hazardous material and can be safely disposed of by either land application or land filling. However, consultation should take place with the environmental regulator to confirm appropriate protocols. Sediment testing may be required before sediment excavation to determine its classification and appropriate disposal methods. For industrial site runoff, sediment testing will be essential. In the majority of cases, it will be acceptable to distribute the sediment on site if there is an appropriate safe and acceptable location to do so.

Many of the specific maintenance activities for gravel trenches can be undertaken as part of a general landscaping contract. If landscape management is already required at site, this should have marginal cost implications.

Maintenance activities should be detailed in the Health and Safety Plan and a risk assessment should be undertaken.

Turning Water Around…®

Hydro International Warranty, Maintenance and COSHH Statement

This statement covers all Hydro International Hydro-Brake® Optimum, Hydro-Brake® and S-Type Vortex Flow Control units (hereafter referred to as "Flow Control").

Defects Liability Period Warranty

The standard Hydro International warranty covers products for one year from date of purchase and will only be considered for those defects or faults reported directly to Hydro International in writing. Warranties will not be considered for defects or faults caused by accident, acts of vandalism or unauthorised repair/rectification. Please Contact Hydro International for product specific details.

Maintenance

Normally, little maintenance is required as there are no moving parts within the Flow Control. Experience has shown that if blockages occur they do so at the intake, and the cause on such occasions has been due to a lack of attention to engineering detail such as approach velocities being too low, inadequate benching, or the use of units below the minimum recommended size. The Flow Control (where applicable) is fitted with a pivoting bypass door, which allows the manhole chamber to be drained down should blockage occur. The smaller conical units, below the minimum recommended size, are also supplied with rodding facilities or vortex suppressor pipes as standard.

Following installation of the Flow Control it is vitally important that any extraneous material i.e. building materials are removed from the unit and the chamber. After the system is made live, and assuming that the chamber design is satisfactory, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. If problems are experienced, please do not hesitate to contact the company so that an investigation may be made.

All Flow Control units are typically manufactured from grade 304 Stainless Steel, and if required they can also be manufactured in grade 316 Stainless Steel. Both materials have an estimated life span in excess of the design life of drainage systems.

COSHH

Flow Control units are manufactured from Stainless Steel, which is not regarded as hazardous to health and exhibits no chemical hazard when used under normal circumstances for the stated applications.

Manual Handling

The handling of Flow Control units should be in accordance with the current legislation and regulations:

- The Health and Safety at Work Act 1972
- The Management of Health and Safety at Work Regulations 1999
- The Manual Handling Operations Regulations 1992

All published and printed by the Health and Safety Executive.

Hydro International (UK) Ltd, Shearwater House, Clevedon Hall Estate, Victoria Road, Clevedon, BS21 7RD
Tel: 01275 878371 Fax: 01275 874979 Web: www.hydro-int.com

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Permeable Asphalt Paving Operation & Maintenance Requirements

Regular inspection and maintenance is important for the effective operation of pervious pavements. The facility should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Pervious surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability. Manufacturers' recommendations should always be followed.

A brush cleaner, which can be a lorry-mounted device or a smaller precinct sweeper, should be used and the sweeping regime should be as follows:

1. End of winter (April) – to collect winter debris.
2. Mid-summer (July/August) – to collect dust, flower and grass-type deposits.
3. After autumn leaf fall (November).

The reconstruction of failed areas: Materials removed from the layers below the surface may contain heavy metals and hydrocarbons and may need to be disposed of as controlled waste. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

Pervious pavement operation and maintenance requirements

Maintenance schedule	**Required action**	**Frequency**
Regular maintenance	Brushing	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilize and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually

Maintenance schedule	Required action	Frequency
Monitoring	Monitor inspection chambers	Annually

Maintenance activities should be detailed in the Health and Safety Plan and a risk assessment should be undertaken.

Permeable Paving Operation & Maintenance Requirements

Regular inspection and maintenance is important for the effective operation of pervious pavements. The facility should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Pervious surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability. Manufacturers' recommendations should always be followed.

A brush cleaner, which can be a lorry-mounted device or a smaller precinct sweeper, should be used and the sweeping regime should be as follows:

1. End of winter (April) – to collect winter debris.
2. Mid-summer (July/August) – to collect dust, flower and grass-type deposits.
3. After autumn leaf fall (November).

Care should be taken in using vacuuming equipment to avoid removal of jointing material. Any lost material should be replaced.

If reconstruction is necessary, the following procedure should be followed:

1. Lift surface layer and laying course.
2. Remove any geo-textile filter layer.
3. Inspect sub-base and remove, and replace if required.
4. Renew any geo-textile layers.
5. Renew laying course, jointing material and concrete block paving.

The reconstruction of failed areas of concrete block pavement should be less costly and disruptive than the rehabilitation of continuous concrete or asphalt porous surfaces due to the reduced area that is likely to be affected. Materials removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and may need to be disposed of as controlled waste. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

Pervious pavement operation and maintenance requirements

Maintenance schedule	**Required action**	**Frequency**
Regular maintenance	Brushing	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilize and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements

Maintenance schedule	Required action	Frequency
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting, and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every ten to fifteen years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Maintenance activities should be detailed in the Health and Safety Plan and a risk assessment should be undertaken.